THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

Policy and Global Affairs
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April 16, 2004

To: Michael Boyd, Cognizant Technical Officer
Office of Economic Restructuring and Energy (EREO)
U.S. Agency for International Development/Armenia

From: Glenn Schweitzer, Director, Office for Central Europe and Eurasia

Re: Quarterly Report on Cooperative Agreement #111-A-00-03-00080-00
Science and Technology in Armenia: Current Status and Future Prospects

As required under point A.5 of the above-mentioned Cooperative Agreement, we are hereby submitting our quarterly performance report for the period January 1 through March 31, 2004, on the project "Science and Technology in Armenia: Current Status and Future Prospects." The required financial report will be submitted separately by the Office of Budget and Financial Reporting of the National Academies.

Achievements During the Quarter

Beginning in early January, project staff corresponded with staff from the U.S. Embassy Yerevan and the Armenian Academy of Sciences to initiate the scheduling of meetings and make the necessary logistical arrangements for the committee's planned visit. In addition, a briefing meeting was organized for project staff and DC-based committee members. Held at the National Academies on February 6, the session featured presentations from the Armenian Ambassador to the United States, Arman Kirakossian (see copy of remarks attached), as well as representatives from the U.S. Civilian Research and Development Foundation, the U.S. Department of State, and the U.S. Agency for International Development. Background materials provided by briefing session participants as well as other relevant documents collected by project staff were subsequently sent to all committee members to help them prepare for their visit to Yerevan.

All six committee members and two Academies staff members traveled to Armenia February 21 through 29 (one of the staff members had arrived a week earlier to coordinate the necessary meeting arrangements with local Academy and Embassy personnel). The group was also accompanied by an observer/liaison from USAID, Dr. Rosalyn Hobson, who is currently a AAAS Fellow at the agency. In order to visit the maximum number of sites in the limited time they had available, the team split into three subgroups according to the members' expertise: Physics, Chemistry, and Information Technologies; Energy and Environment; and Biological and Agricultural Sciences. A copy of their full schedule of meetings and visits is attached. On their final day in Yerevan, the committee worked on a detailed outline of the report, discussed the

recommendations they would make, and made writing assignments to each member. By the end of this reporting period, most of the sections had been submitted in initial draft form, to be reviewed and edited by the committee chair and staff for further discussion and revision by the full committee.

During the February visit to Yerevan, project staff also located and interviewed an experienced translator who is prepared to translate the report from English into Armenian and coordinate its printing in bound form in Yerevan. He will receive the report text to be translated as soon as the final English version is approved by the committee and is ready to enter the Academies' review process.

Obstacles Encountered and Addressed

Initial attempts by project staff to contact the leadership of the Armenian Academy and engage them in the planning effort for the committee's visit met with unresponsiveness, and some difficulties were also encountered in establishing points of contact at the U.S. Embassy Yerevan. However, once the Embassy and the Armenian Academy assigned staff members to work on helping to coordinate the committee's visit, things went very well. Armine Yeghiazarian, Traver Gudie, David Letteney, and Samvel Hovhannissian of the U.S. Embassy provided invaluable assistance, and Gagik Evoyan and Karine Gevorgyan at the Armenian Academy were also very helpful. Once the committee arrived in Armenia, no significant obstacles were encountered, and in fact both the Embassy and Armenian Academy staffs were very flexible in adjusting the program at the committee members' request to add extra meetings and site visits to an already full schedule. The interpreters arranged by the Embassy were outstanding and contributed significantly to the success of the mission.

Plans for Next Quarter

During the coming quarter, the committee and staff will work intensively on compiling the contributions written by the various committee members into a coherent report and assembling additional background material to be included in the report appendices. It is likely that the committee will have a one-day meeting in Washington, probably in June or early July, to come to a final consensus on their recommendations and approve the report text. Once the committee has approved the report, it will enter the National Academies process for institutional report review.

cc: USAID Development Experience Clearinghouse
Ms. Maria Longi, State Department EUR/ACE

Ambassador Arman Kirakossian's Presentation at the National Research Council Committee on Science and Technology in Armenia
Washington, DC

February 6, 2004

First, I want to thank the National Research Council and Mr. Schweitzer for extending me an opportunity to speak before you and present the Armenian Government's perspective on the science and technology in Armenia. I am glad to see representatives from State Department, USAID, and CRDF. Armenia is fortunate to have the support of the people and the Government of the United States in many areas, and your assistance in the area of science and technology is helping to preserve a bright future for Armenia.

I want to start by emphasizing that the single distinct feature of the Armenian reality is the human capital of the nation. Unlike its neighbors, Armenia does not have oil, or gas, or other natural resources in significant amounts. What we have is people. Education is a priority for most if not all Armenian families. In fact, since the Armenian alphabet and the literature in Armenian first appeared, in 5th century AD, education, literary tradition, and scientific pursuit have been an important part in preservation of the national identity.

The reason it matters is this. The collapse of the Soviet Union, 1988 earthquake, and economic blockades brought severe hardship and drastic reduction in national income. The poverty and income statistics for Armenia are not encouraging, but the presence of a strong educational and scientific capacity is an indication that the long-term development of Armenia can be assured. Yet, the maintenance and modernization of this capacity is essential if we want to preserve the high levels of literacy, higher education, and scientific potential that Armenia enjoyed at the outset of independence in 1991 and continues to enjoy even now.

The literacy rates for Armenia are almost 100%, and the number of people with higher education is among the highest in the world. The secondary education is compulsory and

free of charge through grade ten. The main problems, however, is the general economic conditions in the country. Similar problems continue to exist in the science sector. During the Soviet times, the organizational structure was highly centralized and based on the Academy of Sciences. Some research institutions reported directly to federal agencies in Moscow, and some to local Armenian ministries. The economic transition in Armenia has had a major impact on the science, basic and applied research, and technological development. Armenia has more than 140 scientific institutes, centers, and other units, including major institutions like the Yerevan Physics Institute, Byurakan Observatory, Microbiological Depository Center. The National Academy of Sciences coordinates fundamental and applied research in different fields. As a state scientific organization, the NAS unifies scientific and research institutes and subsidiary services. In 2001, the Academy system has a total staff of about 4600 employees, including a scientific staff of about 2400 (116 Academicians, 340 Doctors of Science, 1150 Candidates of Science).

The story of the Armenian science in the last decade was a story of survival and adaptation to the new conditions. In 1998, the scientific R&D expenditure in Armenia was 0.3% of GDP, and the educational expenses were less than 2% of the GDP. Although the state funding is very low, the Armenian scientists are doing excellent work in many areas, due to substantial scientific potential, recognized schools, research-oriented scientific traditions, and good equipment. The number of scientific publications was 0.8 per scientists per year in 1998, and the ratio of scientific personnel to general population was 0.17%. The scientific institutions of course experienced a major problem as many scientists have emigrated. Yet, sometimes is can be beneficial as well because the former staff members have helped to establish good contacts between their former and current institutions.

I want to speak about a problem of brain drain and emigration from Armenia. Armenia's census in 2002 showed that the permanent population in Armenia comprised 3 million people, implying an emigration of close to 800,000 people since 1989. The emigration has now significantly slowed down, but it is a cause of concern. The emigration of people from Armenia is the tragic result of underutilized economic potential. Nor is it an isolated

phenomenon: we know from history that Ireland has suffered a similar brain-drain which is now being reversed. I have confidence that eventually, as Armenia's economic progress picks up, it will be possible to stop and reverse the migration in Armenia.

Soviet Armenia's economy, which was approximately twice the size of current GDP, was anchored in the Soviet Union's command economy. By 1989 Armenia had developed heavy industry, including radio electronics, defense, and chemical industries. This was a blessing in disguise, because it allowed a high level of urban employment but made Armenia completely dependent on the Soviet Union. Cities were built that depended on one huge plant to provide employment, like Hrazdan, Charentsavan, Kapan. Pollution and social problems also arose.

Well, the Soviet Union no longer exists. Those enterprises that employed thousands of people are now idle, and the people who worked there found themselves out of job. The problem of unemployment is especially tough for those with fewer skills. The Armenian Government and the World Bank estimate that more 50% of population is vulnerable while 23% live in dire poverty. The Government, working together with its donors, has adopted a national strategy for poverty reduction that will stress creation of economic opportunities, training, and targeted social work to significantly reduce poverty by 2014. Armenia's budget, which is much smaller than it was a decade ago, is also strained with important expenditures on national defense and security, rebuilding the earthquake zone, and social welfare.

Obviously, the Armenian government is concerned about the future of the science and education. There is a government activities program, adopted in August 2000 that also addresses the situation in this field. The government plans to press ahead with the reforms of the secondary school, including streamlining the number of schools, increase in their academic autonomy, and introduction of per-student subsidies to each school (instead of current, fixed financing from the budget which is not flexible). This process, called "optimization" is underway in Armenia. Eventually, the government plans to introduce a six-day week for school students, and an eleven-grade secondary education.

An average secondary school now has ten grades, 1 through 10. In American terms, the students go through elementary, middle, and high school while attending the same secondary school.

The Government plans to develop a national program for development of the education system. This program would provide for a significant increase in teacher's salaries, training, establishment of teachers' training and continuing education centers.

As there are many private colleges operating in addition to the already established state colleges and universities, the government plans to develop a strong licensing and accreditation mechanism, based on solid standards and to increase the colleges' autonomy. The government works with the US State Department-sponsored program, called Project Harmony, and other foreign donors to provide Internet connectivity for Armenia's secondary schools and state universities, to allow the students and faculty to fully utilize the modern research and high technology tools available through the INTERNET.

Science:

The government views the science sector, including the research institutes and laboratories, as an essential factor in the long-term economic and social development of the country. The primary objectives of the reforms in this sector should be the optimization of the structure and management of the scientific institutions, and securing a steady flow of financing for them. In addition to state budget financing, the government envisages incentives for encouraging private sector and third-party financing of R&D projects. The government consistently increased science funding; this year's budget allocates approximately 6 million dollars (1% of total government expenditures) to the scientific institutions.

A major help to the struggling scientific institutions is the existence of international foundations helping the scientists in Armenia. The U.S. Government has established the Civilian Research and Development Foundation, which provides grant funding to the NIS

scientists; I know Dr. Modzelewski is going to make a presentation on CRDF later this morning. There is International Scientific-Technical Center, a cooperative venture with the EU and Government of Japan, that fosters contacts between western scientific institutions and their counterparts in Armenia. The U.S. Government runs a number of other programs that benefit the Armenian scientists and educational institutions, for example, the Muskie Scholarship program that allows dozens of Armenian graduate students to study in the U.S. every year. There's an organization called Armenian Engineers and Scientists of America that is comprised of Armenian American scientists, as well as the scientists who have emigrated from Armenia have also been of great help to their Armenian colleagues. These programs have helped sustain the scientific institutions, orient them toward private sector's needs, and establish a culture of good cooperation and collaborative efforts with their counterparts in the U.S. and European countries.

I don't want to create an impression that everything is bleak in the Armenian science. There are indeed many success stories. A recently published Armenian hi-tech directory lists products by 38 Armenian scientific institutes and their branches. This is a testimony to their enterprising spirit and adaptation to new times. The Cosmic Ray Division of Yerevan Institute of Physics participates in global net of scientists involved in detecting neutrinos and other cosmic particles. New discoveries are made by the Armenian scientists in Armenia in physics, chemistry, and other areas.

As I said, many of the Armenian scientists who emigrated abroad continue to engage in research and help their colleagues back home to stay tuned to the current developments. One example: Yuri Oganessian, one of the scientists in Russia's Institute of Nuclear Reactions who together with their American colleagues announced the recently-announced discoveries of new heavy elements, is from Armenia originally. One area where expatriates proved particularly helpful was IT sector, which became a booming sector. There are more than 20 large IT companies in Armenia that capitalized on existing potential and the expertise of people like Ashot Hovanesian, whose emigrated to the United States, established a company in Virginia, called Synergy International, that

supplies information management systems to the U.S. government and corporations. A significant part of the software is written by the Armenian branch of his company. Most Armenian IT companies work for U.S. and European customers.

There is another project that deserves the support of the government and the international community, including the construction of Center for the Advancement of Natural Discoveries using Light Emission (CANDLE). This project will benefit Armenia and the larger region, because fundamental science knows no boundaries. I know that's one of the areas your team will look at in Armenia, and I certainly want that project to succeed.

Natural sciences should not be the only area that you explore, as the potential for social science is also great in Armenia. In particular, due to a rich history, literature, and culture, the Armenian Studies is one area where there exists strong cooperation between the Armenian researchers and their colleagues in foreign universities and in the Diaspora. Existence of institutional links between Armenian Studies chairs and departments can help facilitate contacts between academic institutions in Armenia and the United States; it's also one area that attracts significant attention and funding from the Armenian Diaspora.

As you travel to Armenia and meet with your colleagues in the academic institutions, you will discover a spirit of partnership, desire to collaborate, and willingness to new ideas and proposals. I am saying that from the personal perspective, as I have had the privilege of working in the Academy of Sciences system prior to joining the Foreign Ministry. The Armenian Government and the Ministry of Education and Science will also be interested in the results of your work.

The key to the future of Armenian science is to increase the government funding in this area, but also encourage the private sector's direct participation and feedback in this process. I am sure that your study will provide concrete suggestions that will help the Government, its international partners, and the scientific community.
Thank you.

Agenda
National Academies
February 21 – 29, 2004

Saturday, February 21, 2004
Arrive in Yerevan

Sunday, February 22, 2004

13:00-15:00 Meeting with American University of Armenia Faculty (including Engineering Research Center)

13:00-15:00 Meeting with Ashot Chilingarian, Yerevan Physics Institute (Dr. Barish)

15:00-18:00 Tour of Yerevan

Monday, February 23, 2004

10:00-10:50 Meeting with Ambassador John Ordway at the Embassy

11:00-13:00 Roundtable with Armenian Academy of Sciences Officers and Institute Directors

13:00-13:50 Lunch at National Academy of Sciences

14:00-16:00 Group 1 Yuri Shoukouryan, Director of Information and Automation Problems Institute

14:00-15:30 Group 2 Areg Galstian, Deputy Minister of Energy

14:00-15:30 Group 3 Samvel Avetissian, Deputy Minister of Agriculture

16:30-18:30 Group 1 Hanry Nersesyan, Institute of Mathematics
Institute of Mechanics

16:30-17:30 Group 2 Michael Boyd, EREO, USAID

16:30-18:00 Group 3 Tamara Sargsyan, Director of Center of Medical Genetics

Tuesday, February 24, 2004

10:00-12:00 Group 1 Hovhannes Avoyan, President of Union of Information Technology Enterprises

10:00-12:00 Group 2 Rouben Jrbashyan, Director of Institute of Geological Sciences

10:00-11:00 Group 3 Tatul Hakobyan, Deputy Minister of Health

14:00-16:00 Group 1 Haroutyun Karapetyan, Director of NFSAT (National Foundation for Science and Advanced Technology)

14:00-16:00 Group 2 Meeting at Institute of Economics

14:00-16:00 Group 3 Konstantin Karageuzyan, Director of Institute of Molecular Biology

16:30-17:30 Group 1 Armen Gyukchian, Deputy Director, Mshak Company

18:00-19:00 Group 1 Gagik Gunatyan, Director of Institute for Laser Technologies

Wednesday, February 25, 2004

10:00-12:00 Group 1 Radik Martirosyan, Director of the Institute of Radiophysics and Electronics
Edward Vardanyan, Director of Institute for Physical Research
Haik Haroutyunyan, Director of Byurakan Observatory

10:00-11:30 Group 2 Georgi Shekhian, Head of GeoEconomics SJSC
Aram Ter-Zakaryan, Head of International Cooperation Department, Ministry of Environment

10:00-12:00 Group 3 Jean Akopian, Director of Institute of Microbiology
Evrik Afrikyan, Director of State Microbial Depository Center

14:00-16:00 Group 1 Alpik Mkrtchian, Director of Institute of Applied Problems of Physics

14:00-16:00 Group 2 Serge Adamian, President of SolarEn LLC and H2 Economy

14:00-16:00 Group 3 Vilen Hakobyan, Rector of Yerevan State Medical University

17:00-18:00 Group 1 Bagrat Yengibarian, Director, Enterprise Incubator Foundation

Thursday, February 26, 2004

10:00-12:00 Group 1 Adolph Mantashyan, Director of Institute of Chemical Physics

10:00-12:00 Group 2 National Survey for Seismic Protection

10:00-12:00	Group 3	Arshaluys Tahverdian, Rector, Armenian Academy of Agriculture
13:00-14:00	Group 1	Lilit Tutkhalian, Head of Americas Department, Ministry of Foreign Affairs
13:00-15:00	Group 2	Armen Saghatelyan, Director of Institute of Noosphere Studies
13:00-14:30	Group 3	Derenik Dumanian, Director of Armenian National Institute of Health
15:00-16:00	Group 1	Ara Avetissian, Deputy Minister of Education and Science
15:00-16:00	Group 3	Suren Mamayan, Director of Molecular Structure Research Center
16:00-17:00	Group 3	Institute of Organic Chemistry
16:30-18:00	Group 1	Radik Martirosyan, Rector of Yerevan State University
17:15-18:00		Meeting with Anna Grigorian, Project Management Specialist, USAID (Dr. Salyers only)

Friday, February 27, 2004

9:00-10:30	Group 1	Vasili Tsakanov, Technical Director, CANDLE Project
10:00-11:30	Group 2	Levon Yeghiazarian, Director of Institute of Energy Research
11:00-12:00	Group 1	Vahram Nercissiantz, Chief Economic Advisor to the President
13:00-15:30	Group 2	Yuri Sargsyan, Rector of Yerevan State Engineering University; Arest Beglaryan, Rector of Yerevan State University of Architecture and Construction
13:00-14:30	Group 3	Institute of Biotechnology
13:30-14:30	Group 1	Gagik Grigorian, Head of the Int'l Relations Department, Ministry of Transportation and Communications
15:00-16:30	Group 1	Tigran Davtian, Deputy Minister, Ashot Ghandanian, Department Head, Ministry of Trade and Economic Development
15:00-16:30	Group 3	Emil Gabrielyan, Director of Drug and Medical Technology Agency

16:00-17:30	Meeting with USDA staff at U.S. Embassy (Dr. Anex)
17:00-18:00	Meeting with Rubik Hovsepian, Deputy Chairman of the Standing Committee on Science, Education, National Assembly (Dr. Neureiter, Dr. Baldeschwieler, Dr. Salyers, Vahe Mkrtchian, Interpreter)
17:00-18:00	Meeting with young scientists and students at Yerevan State University (Dr. Barish, Dr. Filson)
19:00-22:00	Dinner for Armenian Academy officials and university rectors hosted by U.S. delegation at Old Yerevan Restaurant.

Saturday February 28, 2004

09:30-17:00	Report writing session

Sunday February 29, 2004

Depart for US

Group One- Physics, Chemistry, IT: Barish, Neureiter, Baldeschwieler*
Group Two- Energy, Environment: Anex, Filson
Group Three- Biological and Agricultural Sciences: Salyers, Baldeschwieler*

(*Dr. Baldeschwieler alternated between Groups 1 and 3)